Rao, R., J. Miller, Q.M. Ketterings, and H. Krol (2007). Oneida Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-14. 36 pages.

Soil Sample Survey

Oneida County

Samples analyzed by CNAL (2002-2006)

Oneida County (photo credit: Jeff Miller, CCE of Oneida County).

Summary compiled by

Renuka Rao, Jeff Miller, Quirine M. Ketterings, and Hettie Krol

Cornell Nutrient Analysis Laboratory

http://www.css.cornell.edu/soiltest/newindex.asp

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Nutrient Management Spear Program

http://nmsp.css.cornell.edu/

Soil Sample Survey

Oneida County

Samples analyzed by CNAL (2002-2006)

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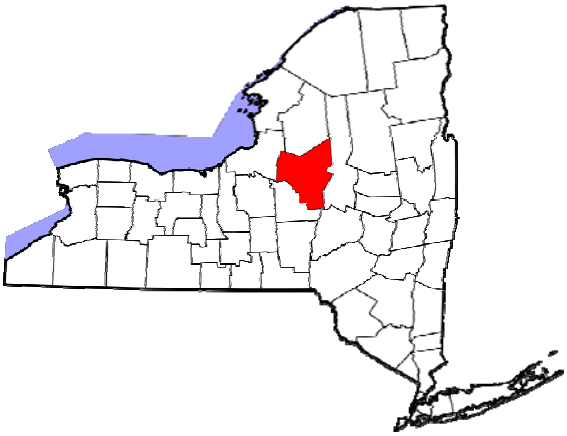
Oneida County (photo credit: Jeff Miller, CCE of Oneida County).

1. County Introduction

Oneida County is located in Central New York, with the Tug Hill Plateau in the northeast, Adirondack Uplands to the northwest and the beautiful Mohawk Valley dissecting the county north and south. The rivers and streams feed into 3 watersheds: the Oneida Lake Basin, the Mohawk River Basin and the Susquehanna River Basin. The county boasts three cities including Utica, Rome and Sherill. Oneida County is bordered by Lewis and Oswego counties to the north, Herkimer to the East and Madison and Otsego to the south.



The total land area of the county is 776,130 acres with approximately 216,000 acres in farm land. Oneida County has a mix of rural, suburban and urban land use with a population estimated at 235,000 people. Its agriculture is also diverse. The 2002 census identifies dairy as the leading agriculture industry with 61% of the total agricultural receipts, vegetables are next with 11% followed by cattle and calves (8%), nursery and greenhouse (8%), grains and dry beans (4%) and other products (8%). Of the 305 dairy farms there are a dozen farms with 300-2000 milking cows. Most of the 21,100 cows in the county are on small farms with 50-100 cows.

Elevation varies greatly in the county going form the highest elevation at Tassle Hill (1944 feet) down to the lowest elevation along the Mohawk (270 feet). The growing season length is impacted by the elevation and ranges from 113-153 days.

Oneida County's precipitation is influenced by its position relative to Lake Ontario. The county receives lake effect snows and rainfall events with weather patterns that cross Lake Ontario. Average rainfall for Oneida County is 45 inches annually.

Oneida County is divided into seven land regions or physiographic areas. These seven regions are unique in terms of climate, relief, flora and fauna, and geological history. The accumulated effects of these differences result in diverse soil types which support a variety of land uses. The soils of Oneida County are greatly influenced by the former

presence of glaciers that blanketed much of what is now New York State. Soil type, productivity and structural properties play significant roles in the determination of land use development trends in Oneida County. A brief description of all seven regions follows.

ONTARIO (ONEIDA) LAKE PLAIN-- The numerous soil types on the Ontario Lake Plain are derived from sedimentary bedrock including sandstone, siltstone, shale and limestone. Low topographic relief produces a flat, plain-like appearance. The land is generally devoted to dairy farming. There are several large areas where acid sandy soils with a cover of brushy woods predominate. Poor drainage coupled with the difficulty of finding outlets are the chief limitations to productive agriculture. Grassland farming is recommended unless land is adequately drained. Less than 10% of the land in Oneida County is located within the Ontario Lake Plain. The major natural hazard of concern in this area is flooding. In addition, Sylvan Beach, located on the eastern shore of Oneida Lake is susceptible to major damage from lake ice pushed onto the shore from the prevailing westerly winds.

ERIE-ONTARIO LOWLAND-- Approximately 25% of the land in Oneida County is located in the Erie-Ontario Lowland area. This area is an extension of the areas in the northwestern parts of New York that roughly parallel the Thruway from Buffalo. The soil types are derived from glacial till from high limestone content. In general, the land has low to moderate relief, north of Route 5 with potential for moderate erosion and wetter soils predominating. In the area south of Route 5, moderate relief and potential for moderate to severe erosion predominate. Many of the soils in this area are considered prime farmland.

APPALACHIAN PLATEAU-- This region covers almost one-half of New York State, including the southern tier from the Hudson River to Lake Erie. In Oneida County, the southernmost region is part of the Appalachian Plateau. The soil types are derived from glacial till from siltstone, sandstone, and shale. The area has moderate to high relief and may have moderate to severe erosion. This area is about 80% wooded with some tracts in state ownership. Some idle land is reverting back to woodland.

BLACK RIVER - MOHAWK RIVER LOWLAND-- Approximately 20% of the land in Oneida County is located within the Black River-Mohawk River Lowlands. The soils in

this region are derived from glacial till from shale and some sandstone. Relief is moderate and erosion can be moderate to severe. This area has a higher snowfall than the areas south of the Mohawk River.

TUGHILL PLATEAU-- The soils in the Tughill Plateau are derived from glacial till comprised of sandstone with some shale. The area has moderate relief and potential for moderate erosion. The soils are rolling and naturally acidic. The land is predominantly wooded but there are a few dairy farms located on the more productive soils in the area. This area is characterized by a measurably shorter growing season and higher snowfall than the areas south of the Mohawk River. Almost 20% of the land in Oneida County is located in the Tughill Plateau.

ADIRONDACK FOOTHILLS-- In this portion of the County, ample evidence of past glaciation exists. As the glacier migrated from the Adirondacks carrying large granite boulders, it gouged and broke into the underlying limestone which left a soil material of both local and foreign origin, covered with glacial erratics which are sometimes several hundreds of tons. In the extreme northeastern portion of the County, at the edge of the Adirondack Park, the glacial soils have been modified by residual material from the underlying metamorphic rocks and by soil forming material from the same rocks. Soils in this region are derived from outwash and glacial till from crystalline metamorphic rock. These soils are naturally acidic. The southern part of the area is rolling with some large level areas which tend to be droughty. The northern part of the area has higher relief with many swampy areas and lakes. This area is mostly wooded with some abandoned land and reforested state land, and is part of the State Forest Preserve. The frost-free growing season is measurably shorter than the southern part of the county and the region generally records a high snowfall. Approximately 10% of Oneida County's land base is located in the Adirondack Foothills.

MOHAWK AND OTHER VALLEYS-- The soils in the valleys are derived from alluvial and outwash deposits derived from the rocks upstream. In the southern part of the county, the soils are derived from sandstone, shale and limestone. The highly productive soils in this portion of the County make it a natural fit for many farms. In the northern part of this province, the soils are derived from red and gray sandstone, with some limestone components at a depth of 3 to 6 feet. Small amounts of shale are sometimes present. Soils in the northern portion of this province can have shallow depths to bedrock and can be

sporadically droughty. In addition, the productivity of these soils is hampered by a shorter growing season. The soils in the southern portion of this province tend to be more productive than their northern counterparts. Soils in the southern portion of this province also tend to be generated from alluvial deposits. Just over 12% of the County's land base is located in this province.

The complexity of the soils in Oneida county, with over 200 mapped soil variants, combined with significant animal agriculture make it very important to regularly test soils to optimize crop production and maintain the quality of the environment.

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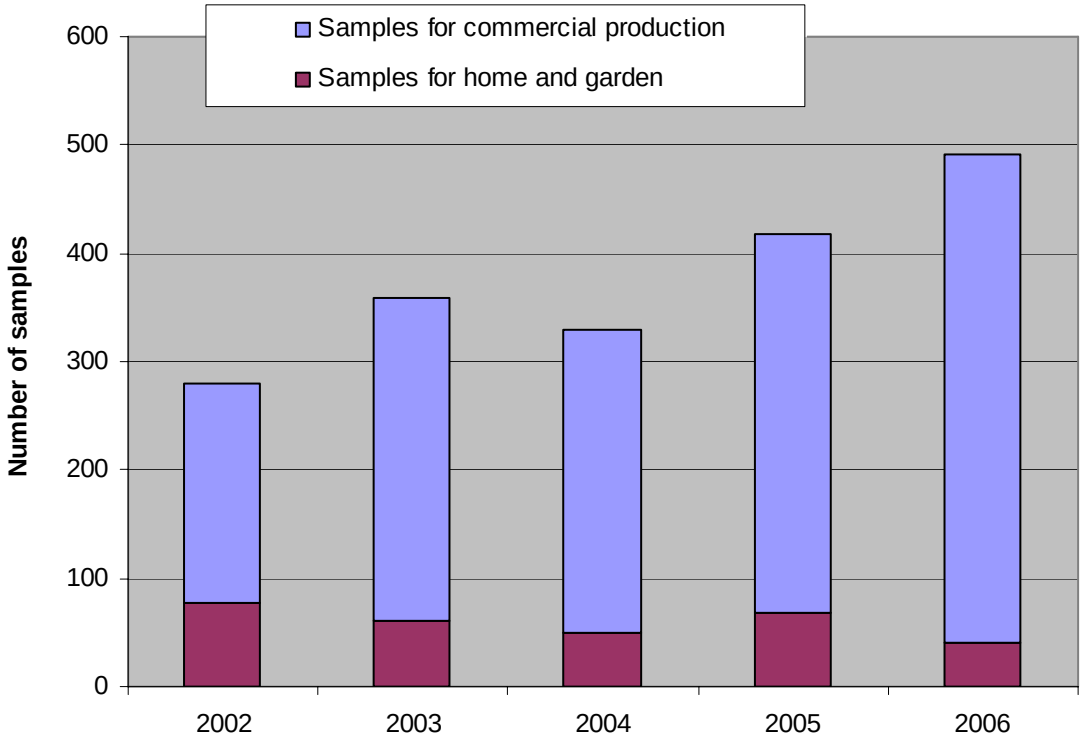
From left to right: John Mishanec, NYS IPM; Richard Lloyd and Deforest Hinman at Candellas Farm in Marcy, NY (photo credit: Jeff Miller, CCE of Oneida County).

2. General Survey Summary

This survey summarizes the soil test results from grower (identified as "commercial samples") and homeowner samples from Oneida County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 1878. Of these, 1581 samples (84%) were submitted by commercial growers while 297 samples (16%) were submitted by homeowners. The number of commercial samples has increased over the years.



Homeowners			Commercial			Total
2002	78		2002	202		280
2003	60		2003	299		359
2004	50		2004	280		330
2005	69		2005	348		417
2006	40		2006	452		492
Total	297		Total	1581		1878

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 predominantly to request fertilizer recommendations for lawns (49%), home garden vegetable production (14%) and perennials (11%). Commercial growers submitted samples to grow alfalfa or alfalfa/grass mixes (28%), corn silage or grain (37%), and grass hay production (9%) while a few growers were planning to grow clover/grass mixes, small grains and other crops.

Soils tested for home and garden in Oneida County were classified as belonging to soil management group 2 (32%), group 3 (26%), group 4 (23%), or group 5 (19%). A description of the different management groups is given below.

Soil Management Groups for New York

1	Fine-textured soils developed from clayey lake sediments and medium- to fine-textured soils developed from lake sediments.
2	Medium- to fine-textured soils developed from calcareous glacial till and medium-textured to moderately fine-textured soils developed from slightly calcareous glacial till mixed with shale and medium-textured soils developed in recent alluvium.
3	Moderately coarse textured soil developed from glacial outwash and recent alluvium and medium-textured acid soil developed on glacial till.
4	Coarse- to medium-textured soils formed from glacial till or glacial outwash.
5	Coarse- to very coarse-textured soils formed from gravelly or sandy glacial outwash or glacial lake beach ridges or deltas.
6	Organic or muck soils with more than 80% organic matter.

Of the samples submitted by commercial growers, 49% belonged to soil management group 2. One percent belonged to group 1. Fourteen percent were from group 3, 22% from group 4 and group 5 was represented by 13% of the samples. There were no organic soils. Cazenovia was the most common soil series (13% of all samples), followed by Lansing (10%), and Alton, Nellis and Honeoye (9% each).

Organic matter levels, as measured by loss--ignition, ranged from less than 1% to almost 60%. For homeowners most samples had between 2 and 5% organic matter (54% of all samples), 17% testing between 5 and 6% organic matter and 11% was classified as soils

with more than 6.9% organic matter. Of the samples submitted by commercial growers, 85% contained between 2 and 5% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.5 to 8.7 for home and garden samples while 58% tested between pH 6.0 and 7.4. For the commercial samples, the highest pH was 8.0 and 75% tested between 6.0 and 7.4.

Extractable nutrients such as phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), manganese (Mn), and zinc (Zn) were measured using the Morgan method (Morgan, 1941). This solution contains sodium acetate buffered at pH of 4.8.

Soil test P levels of <1 lb P/acre are classified as very low. Between 1-3 lbs P/acre is low. Medium is between 4-8 lbs P/acre. High testing soils have P levels between 9 and 39 lbs P/acre and anything higher is classified as very high. For homeowners, 10% of the soils tested low for P, 20% tested medium, 49% tested high and 21% tested very high. This meant that 70% tested high or very high in P. For commercial growers, only 3% tested very high. In total 34% were low in P, 30% tested medium for P while 33% of the submitted samples were classified as high in soil test P. This means that 36% tested high or very high in P.

Classifications for K depend on soil management group. The fine textured soils (soil management group 1) have a greater K supplying capacity than the coarse textured sandy soils (soil management group 5). Classification for each of the management groups in the above table represent very low, low, medium, high and very high. So for example for soil management group 5 and 6, <60 lbs K/acre means the soil is very low in K, between 60 and 114 lbs K/acre is medium, 115-164 lbs K/acre is medium, 165-269 lbs K/acre is high and >269 lbs K/acre is classified as very high (see Table on page 8).

Potassium classifications for Oneida County soils varied from very low (2% of the homeowner soils and 2% of the commercial growers' soils) to very high (43% of the homeowner soils and 30% of the commercial growers' soils). For homeowners, 15% tested low in K, 19% tested medium, and 22% tested high for potassium. For commercial growers' soils, 12% tested low, 33% tested medium and 30% tested high in K.

Soil Management Group	Potassium Soil Test Value (Morgan extraction in lbs K/acre)				
	Very low	Low	Medium	High	Very High
1	<35	35-64	65-94	95-149	>149
2	<40	40-69	70-99	100-164	>164
3	<45	45-79	80-119	120-199	>199
4	<55	55-99	100-149	150-239	>239
5 and 6	<60	60-114	115-164	165-269	>269

Soils test very low for Mg if Morgan extractable Mg is less than 20 lbs Mg/acre. Low testing soils have 20-65 lbs Morgan Mg per acre. Soils with 66-100 lbs Mg/acre test medium for Mg. High testing soils have 101-199 lbs Mg/acre while soils with more than 200 lbs Mg/acre in the Morgan extraction are classified as very high in Mg. Magnesium levels ranged from 5 to almost 6000 lbs Mg/acre. There were only five soils that tested low for Mg within the homeowner samples while 3% of the samples for commercial production tested low in Mg. Most soils tested high or very high for Mg (95% of the homeowner soils and 93% of the soils of the commercial growers). In total 3% of the homeowner soils and 4% of the commercial growers' soil tested medium in Mg.

Soils with more than 50 lbs Morgan extractable Fe per acre test excessive for Fe. Anything lower than 50 lbs Fe/acre is considered normal. Only 3% of the homeowner and commercial grower soils testing excessive for Fe. Similarly, most soils (93-99%) tested normal for manganese. Soils with more than 100 lbs Morgan extractable Mn per acre are classified as excessive in Mn. Anything less than 100 lbs Mn per acre is classified as normal. Soils with less than 0.5 lb Zn per acre in the Morgan extraction are classified as low in Zn. Medium testing soils have between 0.5 and 1 lb of Morgan extractable Zn per acre. If more than 1 lb of Zn/acre is extracted with the Morgan solution, the soil tests high in Zn. For the homeowner soils, 92% tested high for Zn while 6% tested medium. Of the commercial growers' samples, 9% tested low, 34% tested medium while 57% were high in Zn.

In the following sections, the summary tables for each of the soil fertility indicators described above are given. The appendix contains the crop codes used in section 3.

3. Cropping Systems

3.1 Homeowner Samples

Crops for which recommendations were requested by homeowners:

	2002	2003	2004	2005	2006	Total	%
ALG	0	0	0	1	0	1	0
ATF	1	4	4	5	1	15	5
BLU	1	0	0	0	0	1	0
CEM	0	0	0	0	3	3	1
FLA	1	1	1	0	0	3	1
GEN	0	0	0	11	0	11	4
LAW	48	22	23	31	21	145	49
MIX	0	0	0	0	1	1	0
MVG	10	4	15	2	10	41	14
OTH	3	5	1	3	0	12	4
PER	13	8	2	10	1	34	11
ROD	1	1	0	0	0	2	1
ROS	0	0	1	0	0	1	0
SAG	0	0	3	6	2	11	4
SPB	0	0	0	0	1	1	0
Unknown	0	15	0	0	0	15	5
Total	78	60	50	69	40	297	100

Note: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Crops for which recommendations were requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
AGE/AGT	50	98	95	66	74	383	24
ALE/ALT	17	20	2	6	12	57	4
APP	0	0	0	6	0	6	0
BCE	1	0	0	0	0	1	0
BGE/BGT	0	2	0	0	0	2	0
BKB	1	0	0	0	0	1	0
BLB	0	0	1	1	0	2	0
BNS	0	0	0	2	0	2	0
CGE/CGT	0	3	3	0	4	10	1
CLE/CLT	2	1	1	1	0	5	0
COG/COS	93	113	84	119	169	578	37
GIE/GIT	0	2	1	1	5	9	1
GRE/GRT	10	4	21	13	80	128	8
IDL	1	0	0	4	5	10	1
MIX	2	0	3	0	0	5	0
OAS	5	1	4	6	1	17	1
OAT	1	0	0	0	2	3	0
OTH	1	21	28	1	0	51	3
PGE/PGT	1	0	3	4	0	8	1
PIE/PIT	2	3	15	3	6	29	2
PLE/PLT	0	0	1	0	2	3	0
PNE/PNT	4	0	1	9	16	30	2
POT	0	0	0	0	1	1	0
PUM	1	2	0	0	0	3	0
SOF	0	1	0	0	5	6	0
SOY	3	1	6	2	13	25	2
STS	0	0	2	0	0	2	0
SUD	1	0	0	0	0	1	0
SWC	0	1	1	2	0	4	0
TOM	0	1	0	0	0	1	0
TRE/TRT	0	3	0	0	1	4	0
TRP	0	0	0	0	2	2	0
WHT	2	1	4	5	2	14	1
Unknown	4	21	4	97	52	178	11
Total	202	299	280	348	452	1581	100

Note: See Appendix for Cornell crop codes.

4. Soil Types

4.1 Homeowner Samples

Soil types (soil management groups) for homeowner samples:

	2002	2003	2004	2005	2006	Total	%
SMG 1 (clayey)	0	0	0	0	0	0	0
SMG 2 (silty)	32	24	26	5	8	95	32
SMG 3 (silt loam)	20	22	5	24	7	78	26
SMG 4 (sandy loam)	17	8	15	17	12	69	23
SMG 5 (sandy)	9	6	4	23	13	55	19
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	78	60	50	69	40	297	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Adams	5	1	0	1	1	0	3	0
Altmar	5	0	0	9	5	0	14	1
Altom	5	51	6	20	42	17	136	9
Amenia	4	1	18	8	12	9	48	3
Appleton	2	0	0	1	0	1	2	0
Arkport	4	0	0	2	0	0	2	0
Arnot	3	0	0	0	0	1	1	0
Aurora	2	0	0	0	0	0	1	0
Bice	5	0	1	1	13	0	15	1
Blasdell	3	0	5	0	1	1	7	0
Bombay	4	0	0	0	0	1	1	0
Broadalbin	4	0	7	0	0	0	7	0
Camroden	3	1	4	0	0	0	5	0
Anandaigua	3	2	0	1	5	0	8	1
Cazenovia	2	48	11	21	78	52	210	13
Chadakoin	3	0	0	0	1	5	6	0
Chenango	3	0	4	0	14	1	19	1
Collamer	3	1	0	0	2	1	2	0
Colosse	4	0	2	0	5	2	6	0
Conesus	2	2	6	5	0	20	38	2
Croghan	5	0	0	0	0	1	1	0
Dannemora	4	0	1	0	0	1	2	0
Empeyville	4	1	1	0	3	6	8	1
Farmington	3	0	5	0	0	0	8	1
Farnham	4	0	1	0	1	1	2	0
Fredon	4	0	0	1	1	0	2	0
Fremont	2	0	0	0	2	0	1	0
Galway	4	2	5	2	0	0	11	1
Hamlin	2	1	0	1	3	1	3	0
Herkimer	3	2	4	0	19	2	11	1
Honeoye	2	15	24	32	7	47	137	9
Howard	3	5	5	11	0	11	39	2
Hudson	2	0	8	0	1	0	8	1
Kalura	4	0	0	0	8	12	13	1
Kendaia	2	4	8	18	5	22	60	4
Knickerbocker	5	0	3	1	0	1	10	1

Name	SMG	2002	2003	2004	2005	2006	Total	%
Larsville	2	0	1	0	0	0	1	0
Lakemont	1	0	0	1	0	0	1	0
Lamson	4	0	0	0	0	6	6	0
Lansing	2	8	58	43	11	43	163	10
Lima	2	13	10	25	19	41	108	7
Lordsown	3	0	1	0	1	0	2	0
Lyons	2	1	3	1	1	3	9	1
Madrid	4	1	0	0	0	0	1	0
Malone	4	1	0	1	0	3	5	0
Manlius	3	1	0	1	0	2	4	0
Mardin	3	1	0	0	0	3	4	0
Minoa	4	0	0	0	1	0	1	0
Nellis	4	7	61	39	17	20	144	9
Niagara	3	4	0	0	5	4	13	1
Odessa	2	0	0	16	0	0	16	1
Ondawa	4	0	0	0	2	0	2	0
Ovid	2	0	1	1	2	0	4	0
Palmyra	3	4	2	0	1	2	9	1
Phelps	3	5	1	6	13	14	39	2
Pinckney	3	9	3	3	5	0	20	1
Pittsfield	4	2	10	1	12	11	36	2
Podunk	4	0	0	0	5	0	5	0
Pyrities	4	0	0	0	1	14	15	1
Raynham	3	3	0	0	1	0	4	0
Rinebeck	2	0	0	0	0	7	7	0
Saugatuck	5	0	2	0	0	0	2	0
Schoharie	1	0	0	2	0	5	7	0
Stockbridge	3	2	0	1	0	0	3	0
Teel	2	2	0	2	0	1	5	0
Unadilla	3	1	0	0	1	1	3	0
Venango	3	0	0	1	1	4	6	0
Wakeville	3	0	0	0	1	0	1	0
Walpole	4	0	1	0	0	0	1	0
Wayland	2	0	1	0	5	0	6	0
Westbury	4	0	0	0	0	5	5	0
Windsor	5	0	0	0	5	24	29	2
Worth	4	0	2	0	8	22	32	2
Unknown	-	0	13	1	1	1	16	1
Total	-	202	299	280	348	452	1581	100

5. Organic Matter

5.1 Homeowner Samples

Organic matter (loss-on-ignition method) in homeowner samples (number):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	3	3	9	20	21	14	2	6	78
2003	2	5	6	12	14	11	3	7	60
2004	0	6	9	4	9	11	5	6	50
2005	4	8	8	7	18	14	3	7	69
2006	1	6	13	6	5	1	2	6	40
Total	10	28	45	49	67	51	15	32	297

	2002	2003	2004	2005	2006
Lowest:	0.4	0.2	1.0	0.4	0.5
Highest:	13.8	18.3	41.6	19.3	56.6
Mean:	4.3	4.5	5.2	4.4	5.2
Median:	4.2	4.4	4.5	4.3	3.1

Organic matter in homeowner samples (% of total number of samples):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	4	4	12	26	27	18	3	8	100
2003	3	8	10	20	23	18	5	12	100
2004	0	12	18	8	18	22	10	12	100
2005	6	12	12	10	26	20	4	10	100
2006	3	15	33	15	13	3	5	15	100
Total	3	9	15	16	23	17	5	11	100

5.2 Commercial Samples

Organic matter (loss-on-ignition method) in commercial samples (number):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	0	1	37	86	59	14	4	1	202
2003	3	9	115	117	32	6	6	11	299
2004	1	1	32	116	84	22	7	17	280
2005	3	13	66	159	61	27	3	6	348
2006	3	17	71	179	135	42	2	3	452
Total	10	41	321	657	371	111	32	38	1581

	2002	2003	2004	2005	2006
Lowest:	1.1	0.4	0.6	0.6	0.4
Highest:	7.1	15.9	38.1	9.8	57.1
Mean:	3.8	3.9	4.5	3.7	3.8
Median:	3.7	3.5	3.9	3.5	3.7

Organic matter in commercial samples (% of total number of samples):

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
2002	0	0	18	34	29	7	2	0	100
2003	1	3	38	39	11	2	2	4	100
2004	0	0	11	41	30	8	3	6	100
2005	1	4	19	46	18	8	4	2	100
2006	1	4	16	40	30	9	0	1	100
Total	1	3	20	42	23	7	2	2	100

6. pH

6.1 Homeowner Samples

pH of homeowner samples (numbers):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	0	1	3	7	2	8	24	25	8	0	78
2003	0	0	2	3	2	5	33	12	2	1	60
2004	0	0	1	2	3	6	20	17	1	0	50
2005	0	0	2	1	5	5	32	23	1	0	69
2006	0	1	3	3	11	7	9	6	0	0	40
Total	0	2	11	16	23	31	118	83	12	1	297

	2002	2003	2004	2005	2006
Lowest:	4.9	5.1	5.1	5.0	4.5
Highest:	8.3	8.7	8.3	8.0	7.9
Mean:	-	-	-	-	-
Median:	7.4	7.2	7.3	7.3	6.5

pH of homeowner of samples (% of total number of samples):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	0	1	4	9	3	10	31	32	10	0	100
2003	0	0	3	5	3	8	55	20	3	2	100
2004	0	0	2	4	6	12	40	34	2	0	100
2005	0	0	3	1	7	7	46	33	1	0	100
2006	0	3	8	8	28	18	23	15	0	0	100
Total	0	1	4	5	8	10	40	28	4	0	100

6.2 Commercial Samples

pH of commercial samples (number):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	0	0	6	29	48	73	36	8	2	0	202
2003	1	2	6	29	87	99	57	18	0	0	299
2004	0	3	12	48	78	56	62	19	2	0	280
2005	0	1	16	73	115	102	36	5	0	0	348
2006	0	1	5	63	136	119	94	32	2	0	452
Total	1	7	45	242	464	449	285	82	6	0	1581

	2002	2003	2004	2005	2006
Lowest:	5.3	4.1	4.5	4.8	4.8
Highest:	8.0	7.7	8.0	7.7	8.0
Mean:	-	-	-	-	-
Median:	6.6	6.6	6.4	6.3	6.5

pH of commercial samples (% of total number of samples):

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
2002	0	0	3	14	24	36	18	4	1	0	100
2003	0	1	2	10	29	33	19	6	0	0	100
2004	0	1	4	17	28	20	22	7	1	0	100
2005	0	0	5	21	33	29	10	1	0	0	100
2006	0	0	1	14	30	26	21	7	0	0	100
Total	0	0	3	15	29	28	18	5	0	0	100

7. Phosphorus

7.1 Homeowner Samples

Phosphorus (lbs/acre Morgan P) in homeowner samples (numbers):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
2002	0	9	18	34	6	1	2	5	2	1	78
2003	0	5	9	37	2	4	2	1	0	0	60
2004	0	1	12	24	2	2	3	1	0	5	50
2005	0	14	12	28	6	3	3	2	1	0	69
2006	0	1	8	23	1	2	0	2	1	2	40
Total	0	30	59	146	17	12	10	11	4	8	297

VL = very low, L = low, M = medium, H = high, VH = very high.

	2002	2003	2004	2005	2006
Lowest:	1	1	3	1	3
Highest:	389	128	388	177	665
Mean:	33	26	53	28	55
Median:	13	15	13	16	19

Phosphorus in homeowner samples (% of total number of samples):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
2002	0	12	23	44	8	1	3	6	3	1	100
2003	0	8	15	62	3	7	3	2	0	0	100
2004	0	2	24	48	4	4	6	2	0	10	100
2005	0	20	17	41	9	4	4	3	1	0	100
2006	0	3	20	58	3	5	0	5	3	5	100
Total	0	10	20	49	6	4	3	4	1	3	100

VL = very low, L = low, M = medium, H = high, VH = very high.

7.2 Commercial Samples

Phosphorus (lbs P/acre Morgan extraction) for commercial samples (number):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
2002	0	80	69	51	1	0	0	1	0	0	202
2003	0	76	91	130	2	0	0	0	0	0	299
2004	0	109	61	92	8	2	2	3	0	3	280
2005	0	77	123	139	6	1	1	1	0	0	348
2006	0	192	131	113	9	3	0	4	0	0	452
Total	0	534	475	525	26	6	3	9	0	3	1581

VL = very low, L = low, M = medium, H = high, VH = very high.

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	103	59	597	105	136
Mean:	8	7	16	10	9
Median:	7	6	5	7	5

Phosphorus in commercial samples (% of total number of samples):

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
2002	0	40	34	25	1	0	0	0	0	0	100
2003	0	25	30	43	0	0	0	0	0	0	100
2004	0	39	22	33	3	1	1	1	0	1	100
2005	0	22	35	40	2	0	0	0	0	0	100
2006	0	42	29	25	2	1	0	1	0	0	100
Total	0	34	30	33	2	0	0	1	0	0	100

VL = very low, L = low, M = medium, H = high, VH = very high.

8. Potassium

8.1 Homeowner Samples

Potassium (lbs K/acre Morgan extraction) in homeowner samples (number):

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	0	0	0	0	0	0
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	6	10	16	32
2003	0	0	1	4	19	24
2004	0	0	4	1	21	26
2005	0	0	0	0	5	5
2006	0	0	0	0	8	8
Total (#)	0	0	11	15	69	95
Total (%)	0	0	12	16	73	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	2	9	2	7	20
2003	0	2	8	7	5	22
2004	0	0	1	2	2	5
2005	0	1	1	9	13	24
2006	0	0	1	2	4	7
Total (#)	0	5	20	22	31	78
Total (%)	0	6	26	28	40	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	1	2	4	5	5	17
2003	1	1	1	3	2	8
2004	0	2	4	2	7	15
2005	0	3	1	8	5	17
2006	0	2	4	1	5	12
Total (#)	2	10	14	19	24	69
Total (%)	3	14	20	28	35	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	1	5	1	1	1	9
2003	1	1	3	1	0	6
2004	0	2	1	0	1	4
2005	1	17	1	3	1	23
2006	1	4	4	3	1	13
Total (#)	4	28	10	8	4	55
Total (%)	7	53	18	15	7	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	0	0	0	0	0	0

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	2	9	20	18	29	78
2003	2	4	13	15	26	60
2004	0	4	10	5	31	50
2005	1	21	3	20	24	69
2006	1	6	9	6	18	40
Grand Total	6	44	55	64	128	297

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	3	12	26	23	37	100
2003	3	7	22	25	43	100
2004	0	8	20	10	62	100
2005	1	30	4	29	35	100
2006	3	15	23	15	45	100
Grand Total	2	15	19	22	43	100

	2002	2003	2004	2005	2006
Lowest:	44	33	70	52	40
Highest:	631	624	2279	1054	1413
Mean:	175	183	307	204	268
Median:	159	163	246	187	192

8.2 Commercial Samples

Potassium (lbs K/acre Morgan extraction) in commercial samples (number):

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	1	2	3
2005	0	0	0	0	0	0
2006	0	0	1	2	2	5
Total (#)	0	0	1	3	4	8
Total (%)	0	0	13	38	50	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	5	17	38	35	95
2003	1	9	35	45	41	131
2004	0	17	47	51	51	166
2005	0	3	18	71	53	145
2006	1	7	49	111	70	238
Total (#)	2	41	166	316	250	775
Total (%)	0	5	21	41	32	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	4	5	4	13	14	40
2003	0	4	7	10	13	34
2004	0	3	3	8	10	24
2005	0	0	3	23	36	62
2006	0	4	13	10	25	52
Total (#)	4	16	30	64	98	212
Total (%)	2	8	14	30	46	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	4	6	3	2	15
2003	10	37	32	21	9	109
2004	1	13	16	14	11	54
2005	2	13	22	17	15	69
2006	3	44	29	12	25	113
Total (#)	15	111	105	67	62	360
Total (%)	4	31	29	19	17	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	3	4	6	23	16	52
2003	1	2	4	2	3	12
2004	3	6	8	7	8	32
2005	1	9	9	23	29	71
2006	2	6	10	14	11	43
Total (#)	10	27	37	69	67	210
Total (%)	5	13	18	33	32	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	0	0	0	0	0	0

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	7	18	33	77	67	0	202
2003	12	52	78	78	66	13	299
2004	3	39	74	81	82	1	280
2005	3	25	52	134	133	1	348
2006	6	61	102	149	133	1	452
Grand Total	31	195	339	519	481	16	1581

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	3	9	16	33	33	0	100
2003	4	17	26	22	22	4	100
2004	1	14	26	29	29	0	100
2005	1	7	39	38	38	0	100
2006	1	13	33	29	39	0	100
Grand Total	2	12	33	30	30	1	100

	2002	2003	2004	2005	2006
Lowest:	31	5	8	20	34
Highest:	548	580	1423	784	2313
Mean:	180	128	186	214	173
Median:	154	96	128	165	137

9. Magnesium

9.1 Homeowner Samples

Magnesium (lbs Mg/acre Morgan extraction) in homeowner samples (numbers):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	12	65	78
2003	0	0	2	15	43	60
2004	0	0	4	3	43	50
2005	0	2	0	17	50	69
2006	0	3	3	7	27	40
Total	0	5	10	54	228	297

	2002	2003	2004	2005	2006
Lowest:	92	98	82	29	27
Highest:	790	1305	5853	918	2425
Mean:	372	362	570	411	373
Median:	346	321	454	364	265

Magnesium in homeowner samples (% of total number of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	15	83	100
2003	0	0	3	25	72	100
2004	0	0	8	6	86	100
2005	0	3	0	25	72	100
2006	0	8	8	18	68	100
Total	0	2	3	18	77	100

9.2 Commercial Samples

Magnesium (lbs Mg/acre Morgan extraction) in commercial samples (number):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	3	7	45	147	202
2003	2	10	9	87	191	299
2004	0	4	8	94	174	280
2005	1	4	13	75	255	348
2006	0	23	23	118	288	452
Total	3	44	60	419	1055	1581

	2002	2003	2004	2005	2006
Lowest:	52	5	20	12	21
Highest:	930	1396	997	1100	1139
Mean:	324	236	296	322	321
Median:	305	209	233	396	280

Magnesium in commercial samples (% of total number of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	3	22	73	100
2003	1	3	3	29	64	100
2004	0	1	3	34	62	100
2005	0	1	4	22	73	100
2006	0	5	5	26	64	100
Total	0	3	4	27	67	100

10. Iron

10.1 Homeowner Samples

Iron (lbs Fe/acre Morgan extraction) in homeowner samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	76	2	78
2003	58	2	60
2004	48	2	50
2005	68	1	69
2006	37	3	40
Total	287	10	297

Percentages:

0-49	>49	Total
Normal	Excessive	
97	3	100
97	3	100
96	4	100
99	1	100
92	8	100
97	3	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	2	1
Highest:	164	87	56	68	72
Mean:	10	10	11	9	16
Median:	4	3	7	5	12

10.2 Commercial Samples

Iron (lbs Fe/acre Morgan extraction) in commercial samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	196	6	202
2003	289	10	299
2004	273	7	280
2005	338	10	348
2006	444	8	452
Total	1540	41	1851

Percentages:

0-49	>49	Total
Normal	Excessive	
97	3	100
97	3	100
98	3	100
97	3	100
98	2	100
97	3	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	180	1313	365	207	87
Mean:	8	34	11	12	9
Median:	4	7	6	6	5

11. Manganese

11.1 Homeowner Samples

Manganese (lbs Mn/acre Morgan extraction) in homeowner samples:

Total number of samples: Percentages:

	0-99	>99	Total		0-99	>99	Total
	Normal	Excessive			Normal	Excessive	
2002	75	3	78		96	4	100
2003	54	6	60		90	10	100
2004	47	3	50		94	6	100
2005	65	4	69		94	6	100
2006	35	5	40		88	13	100
Total	276	21	297		93	7	100

	2002	2003	2004	2005	2006
Lowest:	9	5	22	12	6
Highest:	179	175	291	326	469
Mean:	45	57	51	48	58
Median:	39	51	39	37	30

11.2 Commercial Samples

Manganese (lbs Mn/acre Morgan extraction) in commercial samples:

	Total number of samples:			Percentages:		
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
2002	201	1	202	100	0	100
2003	290	9	299	97	3	100
2004	272	8	280	97	3	100
2005	347	1	348	100	0	100
2006	449	3	452	99	1	100
Total	1559	22	1581	99	1	100

	2002	2003	2004	2005	2006
Lowest:	6	2	3	5	5
Highest:	112	155	330	189	563
Mean:	28	42	40	31	32
Median:	25	33	33	30	20

12. Zinc

12.1 Homeowner Samples

Zinc (lbs Zn/acre Morgan extraction) in homeowner samples:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	1	1	76	78
2003	1	4	55	60
2004	0	5	45	50
2005	0	5	64	69
2006	2	4	34	40
Total	4	19	274	297

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
1	1	97	100
2	7	92	100
0	10	90	100
0	7	93	100
5	10	85	100
1	6	92	100

	2002	2003	2004	2005	2006
Lowest:	0.3	0.4	0.7	0.5	0.3
Highest:	24.2	112.7	92.3	23.0	58.1
Mean:	5.1	8.6	6.3	4.5	5.7
Median:	3.3	4.3	3.4	3.3	2.5

12.2 Commercial Samples

Zinc (lbs Zn/acre Morgan extraction) in commercial samples:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	10	43	149	202
2003	22	123	154	299
2004	8	98	174	280
2005	10	134	204	348
2006	90	144	218	452
Total	140	542	899	1581

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
5	21	74	100
7	41	52	100
3	35	62	100
3	39	59	100
20	32	48	100
9	34	57	100

	2002	2003	2004	2005	2006
Lowest:	0.1	0.1	0.1	0.1	0.1
Highest:	27.0	29.6	35.5	16.9	92.8
Mean:	2.0	1.1	2.8	1.6	1.5
Median:	1.5	0.9	1.3	1.2	1.0

Appendix: Cornell Crop Codes

Crop codes used in the Cornell Nutrient Analysis Laboratory.

Crop Code	Crop Description
	Alfalfa
ABE	Alfalfa trefoil grass, Establishment
ABT	Alfalfa trefoil grass, Established
AGE	Alfalfa grass, Establishment
AGT	Alfalfa grass, Established
ALE	Alfalfa, Establishment
ALT	Alfalfa, Established
	Birdsfoot
BCE	Birdsfoot trefoil clover, Establishment
BCT	Birdsfoot trefoil clover, Established
BGE	Birdsfoot trefoil grass, Establishment
BGT	Birdsfoot trefoil grass, Established
BSE	Birdsfoot trefoil seed, Establishment
BST	Birdsfoot trefoil seed, Established
BTE	Birdsfoot trefoil, Establishment
BTT	Birdsfoot trefoil, Established
	Barley
BSP	Spring barley
BSS	Spring barley with legumes
BUK	Buckwheat
BWI	Winter barley
BWS	Winter barley with legumes
	Clover
CGE	Clover grass, Establishment
CGT	Clover grass, Established
CLE	Clover, Establishment
CLT	Clover, Established
CSE	Clover seed production, Establishment
CST	Clover seed production, Established

Crop Code	Crop Description
	Corn
COG	Corn grain
COS	Corn silage
	Grasses, pastures, covercrops
CVE	Crownvetch, Establishment
CVT	Crownvetch, Established
GIE	Grasses intensively managed, Establishment
GIT	Grasses intensively managed, Established
GRE	Grasses, Establishment
GRT	Grasses, Established
PGE	Pasture, Establishment
PGT	Pasture improved grasses, Established
PIE	Pasture intensively grazed, Establishment
PIT	Pasture intensively grazed, Established
PLE	Pasture with legumes, Establishment
PLT	Pasture with legumes, Established
PNT	Pasture native grasses
RYC	Rye cover crop
RYS	Rye seed production
TRP	Triticale peas
	Small grains
MIL	Millet
OAS	Oats seeded with legume
OAT	Oats
SOF	Sorghum forage
SOG	Sorghum grain
SOY	Soybeans
SSH	Sorghum sudan hybrid
SUD	Sudangrass
WHS	Wheat with legume
WHT	Wheat
	Others
ALG	Azalea
APP	Apples
ATF	Athletic field

Crop Code	Crop Description
BDR/DND	Beans-dry
BLU	Blueberries
CEM	Cemetery
FAR	Fairway
FLA	Flowering annuals
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
MIX/MVG	Mixed vegetables
PER	Perennials
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Establishment
TRF	Turf
TRT	Christmas trees, Topdressing